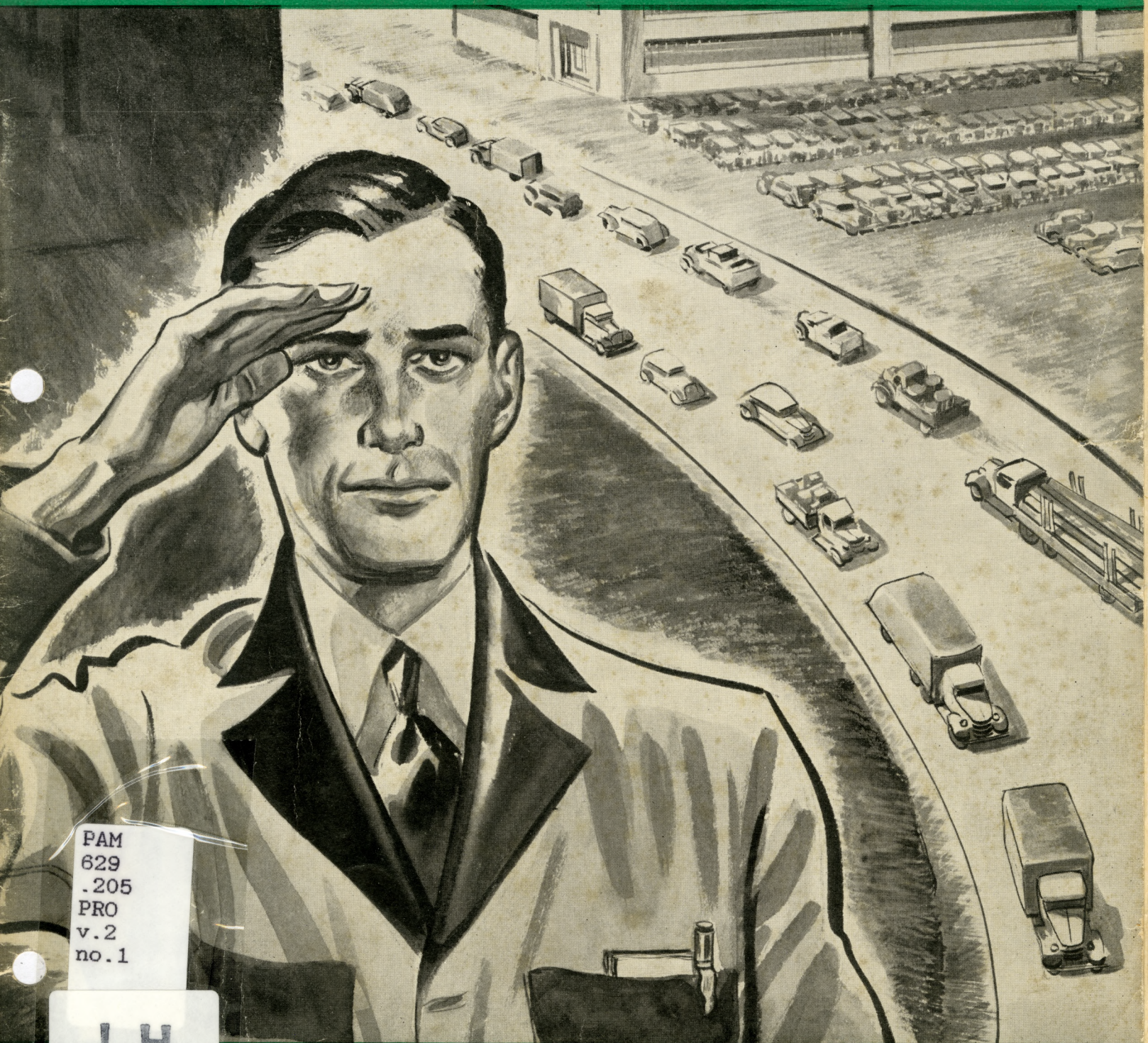


PRODUCTS



REVIEW

and Service News

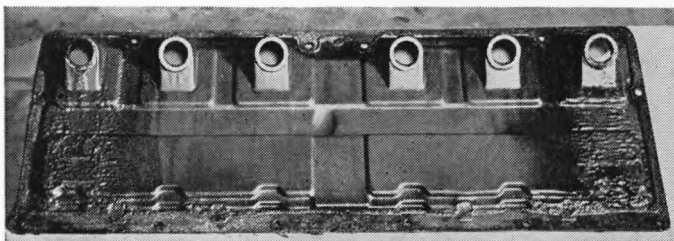


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SLUDGE

AND HOW TO PREVENT IT



Driving Conditions and their Effect on Engine Oils, Etc.

During the past few years the oxidation of engine oils, resulting in sludge, acids, etc., forming in the crankcase has been very prevalent in certain types of operation. Reduced speed limits and gasoline rationing have added to the number of cars and trucks affected by sludge.

Fleet operators of trucks have had to contend with the formation of sludge for some time but with the lowering of the octane rating of gasoline with its consequent slight loss in power and the critical position of replacement materials, the elimination of damage resulting from sludge becomes even more essential.

Sludge formation is closely related to engine operating temperatures,—too high a temperature resulting in the break-down of the oil and oxidation, or too low a temperature resulting in moisture condensation within the crankcase, and unburned or partially burned fuel particles, which when emulsified with accumulated road dust, carbon, etc., results in sludge.

Sludge Appearance:

A brown or black appearing sludge, which is thick and sticky is the result of oxidized oil, due to the high operating temperature of the engine and the consequent break-down of the oil.

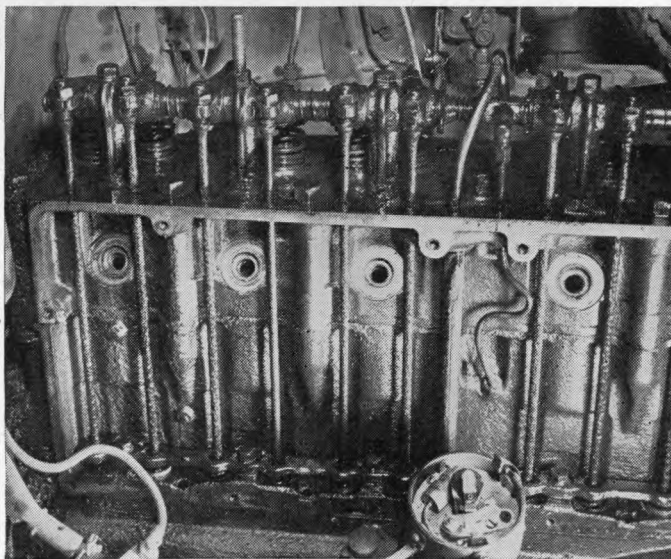
Sludge resulting from too low an operating temperature which causes condensation, blow-by and carbon particles in the crankcase, will always be black in colour. It may be thick and sticky or it may be fairly fluid.

The two types require different treatment.

Corrective Suggestions:

The regulation of oil temperature should be studied to make sure that it is not operating too hot or too cold. The reduction of heat can be accomplished by the use of oil coolers, the use of a less viscous oil, correct water cooling, proper engine tune-up or the reduction of the loads carried.

Where the temperature is too low due to the type of operation, sufficient radiator covering should be used to leave only a sufficient area to maintain normal operating temperature. In the operation of trucks or buses, engines should be heated up in the garage before taking the vehicle out into extreme cold for immediate operation.



Crankcase Ventilation:

Crankcase ventilation is of extreme importance and should be kept in an efficient operating state in order that water vapours may be removed and that the crankcase temperature may be more readily controlled.

The use of a suction type of ventilator has a very beneficial effect on the removal of condensation, etc., and when used with an oil bath air cleaner at the inlet of the system, will considerably reduce foreign materials.

It is therefore, essential that the crankcase ventilating system be given sufficient maintenance attention to keep it in an efficient operating condition. Any filters, cleaners, or valves in the system should be cleaned at regular intervals and all joints must be kept tight.

Air Cleaners and Oil Filters:

The type of operation and maintenance experience will determine the intervals at which air cleaners should be removed and cleaned and oil filter elements replaced. The fact that an oil filter plugs rapidly with sludge is not the fault of the filter. It only proves that it is doing an efficient job.

When heavy duty oils are used, such as described below, the colour of the oil cannot be used as a guide to the necessity of filter element replacement. The oil will start to darken as soon as used, and therefore the filter element must be inspected to determine when replacement is required.

Heavy Duty Oil:

These oils have additives such as inhibitors and detergents which retard sludge formation.

Do not confuse these oils with heavy oils; Heavy Duty oils may be obtained from most oil companies in all the regular engine oil viscosities.

Oil Changing:

When switching from regular to Heavy Duty engine oil special precautions are necessary to prevent early the cleaning of the heavy duty oil which may result in clogging of the oil pump screen or plugging of oil passages. The recommendations of the company where heavy duty oil is being used should be followed diligently when making such a change.

Engine oil should be changed only after the oil is at operating temperature. This is best done after the car or truck comes in off the road, after at least one-half hour of running.

It is obviously necessary that the engine oil be changed at frequent enough intervals, to assist with the prevention of sludge. The periods can best be determined by experience. In some types of passenger car and truck operation, changing engine oil at 500 miles or even less, is not too frequent.

Editorials

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VOL. 2, NO. 1

OSHAWA, ONT.

APRIL

SALVAGE

Here are a few facts about metal. A diesel engine needs 90 pounds of copper for tubes; 21 tons of scrap iron and steel will rivet a corvette; Canada has made over 10,000,000 brass cartridges; the 100 cargo boats made last year took marine brass propellers weighing 270,000 pounds in copper, zinc and tin; it takes one month to collect enough salvaged tin to supply the necessary water canteens for the soldiers in Northern Africa.

This year, expanded war production means more metal. Every garage operator should clean house for metal salvage. No metal should be wasted or thrown away. Obsolete, broken or worn parts are valuable contributions—will you see that any you have on hand find their way to the local salvage depot! That is one more way to help the war effort.

MECHANICS' WAR JOB

A detailed story of your important place as a mechanic in Canada's scheme of things appears on page 82. After reading it, we think you will throw your chest out—that you will feel truly proud of your vocation and the major part the mechanic has in keeping our national transportation ship-shape. As cars and trucks grow older and add more miles to already full speedometers, your job becomes more vital. Stick with it—do what you can to preserve every vehicle that comes into your shop—for the duration.

TOOL and EQUIPMENT MAINTENANCE

The ever increasing demands on essential materials for war is making the procurement of tools and equipment, also tool repair parts, increasingly difficult. In view of this, the preservation of your present equipment is a "must." Tools in poor repair cause unsatisfactory work, loss of time, and even more important, injury to the user. The net cost of all this is — lost man-hours, the value of which is so great today.

A Mechanic's Wartime Job Is to Help "Save the Wheels that Serve Canada!"



Reproduced above is the illustration featured on the cover of this issue of Products Review. It shows the automobile mechanic ready to serve. Behind him we see the vast fleet of motor transport which means so much to our war effort and at the same time is so dependent on his knowledge, skill and experience. Just how important is the mechanic's place in this picture you will discover by reading the following article.

This war is being fought on the *home front* as well as the fighting front. Here, we are fighting the battle of time against the greatest possible odds. We are trying to build and supply the materials and the fighting equipment it takes to beat an enemy who has been preparing for years.

It takes 100,000 man hours to build and equip just one big bomber for our fighting men, and it's going to take thousands of these bombers to fight this war. It takes over 500,000 man hours to build and equip one cargo ship—and these are needed in ever-increasing numbers. If there are no planes, no ships, no guns—and if there is no means of transporting men and materials to make them—there is no fighting front! That's why, in this mechanized war, it takes about 18 people behind the lines and on the home front to keep one man going on the fighting front.

Essential workers include farmers, textile workers, doctors, nurses, war plant employees, miners, ship-builders, communication men and a good many others who could not fulfill their responsibilities to those on the fighting front without the support of the auto

mechanic. The mechanic is the essential worker who keeps both the home front and the fighting front rolling. For example—suppose just one auto mechanic fell down on just one job. Suppose he failed to keep the car running for a war worker who shares the ride with five others. These six workers would fail to get to their plant on time. Oh, they'd probably get there eventually, but they'd put an extra burden on already overcrowded transportation facilities. Meanwhile precious man hours would be lost forever.

If auto mechanics did not keep up a high standard of workmanship, it wouldn't take long these days for a great many cars and trucks to go out of service. If this occurred—

Who would haul meat and foodstuffs to retail stores? Train tracks don't run that far. It takes refrigerator trucks. How would the farmer move his produce and stock to market? He couldn't do it by horse and wagon because, more than likely, his farm is motorized. What about fuel to keep the home warm? What would happen to the supplies for our armed forces from the war plants if our trucks could no longer operate? No one really knows. But this much is acknowledged: Our national war effort would be paralyzed more quickly—more completely—than it would under the greatest bombing foray ever attempted by the enemy.

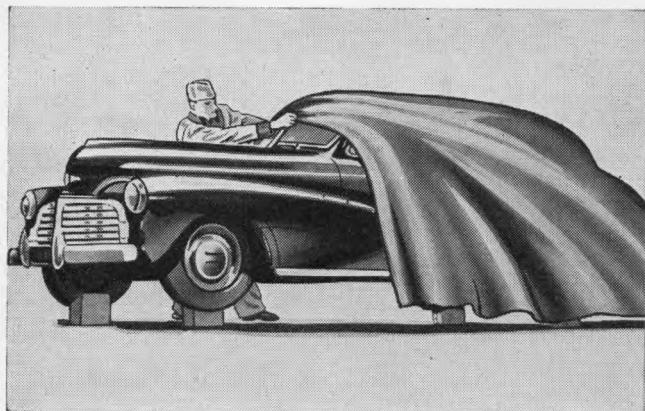
Canada is one of the greatest motorized nations on earth. Canada depends on cars and trucks for its peacetime or wartime activities. Stop them and our army—our navy—and our air force would be betrayed—would collapse. That's why we are fighting this war on the home front.

Time—every minute of it—is needed for this vital work. Don't waste it—Save it. Make every second count. For every hour of productive work here may mean many more months of useful service for this unit of Canada's transportation system. Every tune-up job here may mean one more load of ammunition, steel or fuel for our fighting front—when it's needed!

A lot depends on the way you tighten that bolt and nut to-day—a lot of men, a lot of material, and a lot of time. That's why the auto mechanic is considered an essential worker in the "Selective Service" category. That's why the better you understand the vital importance of *your* job of saving the wheels that serve Canada—the better the fighting job you'll do on the home front.

It's up to you—and the eyes of the nation are on you as never before. The record of your work is written across the highways of our land. You have a big job!

The men on the fighting front can't do without you—The war workers on the home front can't do without you. It makes one feel good to be needed like that.



Idle Cars Invite Trouble

Disuse Means Disintegration For Stored Transportation

For a variety of reasons, many Canadian motorists are liable to consider jacking their cars up on blocks for the duration. First of all—and perhaps most important to the average man—is steeply restricted gasoline. Civilian tires are getting to a point where they demand the greatest care. Short runs—or

entire lack of exercise—bring on many woes. All of which adds up to one thing for some drivers—storing the car.

You can help persuade him against this procedure which is not only harmful to the car—but to Canada's war effort—because it adds extra strain to an already overtaxed transportation system!

Idleness is the arch enemy of mechanism. A car stored for a matter of months loses its elasticity—its very life. It will reveal a good many marks of deterioration. Tires—no matter how carefully stored—will never be quite the same. The battery—if not kept active—cannot retain charge. Many units of the engine will suffer from disuse to a point where only a costly overhaul will buldoze it into operation again. Oh, yes,—finally, upholstery riddled by moths is on the records!

Now the A-A Ration Book, effective April 1st, holds coupons for 120 gallons of gas. At 20 miles to the gallon (and you're the one to see that your customers' cars deliver this mileage or close to it) that's 2400 miles of driving,—more, believe it or not, than most non-essential drivers thought they'd get.

So much for the effect on the motorist and the car. There's another angle—the importance of keeping every car and truck from crock to V-16 ready for service, if need be, on the home transportation front. This problem of getting essential workers, soldiers, sailors and airmen, supplies and materials to their destinations is a tough one right now! What would happen if, on the first of April, the majority of owners put up their cars for the duration is beyond the facilities of transportation and the comprehension of the administration. That is why we can't permit automobiles to rot away in storage!

When it comes to tending their cars your customers depend on your advice—or they wouldn't be using your shop. Advise them, then, to take better care than ever of their possessions. Tell 'em, if it comes to that, that by doing so they are actually preserving their investments—that, after the war, their effort will be rewarded by bigger allowances!

In short—be a Conservation Crusader!

Alcan Highway Now Open for Business

With singular lack of pomp or fanfare, one of the world's great overland highways was opened recently when two soldiers symbolizing the United States and Canada clasped hands at the completion of work on the Alaska Highway.

It is impossible to estimate the strategical value of the "Alcan" way, which snakes for more than 1,600 miles—or twice the length of the Burma Road—through the wildernesses of the west coast from Dawson Creek, B.C., to Fairbanks, Alaska. Its importance, in the matter of defense, is incalculable. In peace, it will speed up transportation between the United States northern possession and the States and Canada. It will open up thousands of miles of territory for the development of natural resources.

The Alcan Highway is a triumph for modern mechanical equipment. Trucks, tractors, bulldozers, graders and power shovels, individually and collectively, have piled up an all-time record of time and performance. Nature did not welcome the intrusion. In fact, she did her best to fight a delaying action deploying, with military genius, quagmires, deep timbers, great

rocks, and wide rivers. But man, in the persons of engineers, construction experts, and soldiers; man, toiling with the latest in mechanical equipment, won through.

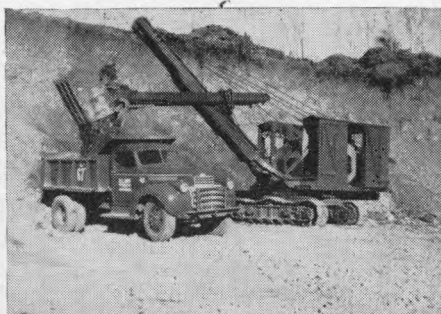
Already, trucks are pouring over the new thoroughfare in both directions. A complete and intricate organization is required to handle this traffic, and the machinery of it is set up and running smoothly. In addition to regulating traffic, road maintenance stations are located at handy intervals along the way. Service stations manned by skilled mechanics and equipped with the latest tools and stocks of parts are ready to put crippled or broken-down trucks back into line again in a hurry.

It's a tribute to the neighbourliness of the two nations that such a scheme could be discussed, much less carried out. But, there it is and, one day, when the Victory is won and travel by car regains its usual place in the nation's transportation plan, we venture to predict that the Alcan Highway will be the most popular vacation site on the continent!

Alcan Highway showing a temporary bridge spanning the Peace River.



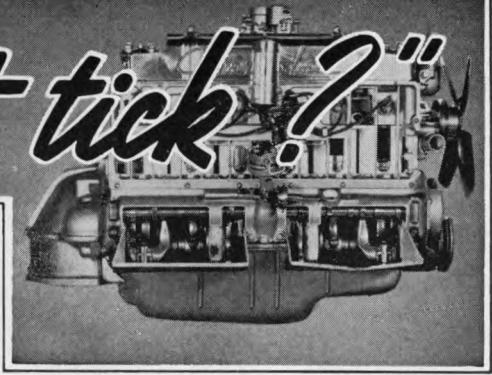
Modern trucks and equipment helped to overcome tremendous obstacles in this mighty project.



Typical stretch of smooth highway now traversing what was uninhabited wilderness.



"What makes it tick?"



BEARINGS

In order to do work most machines must have parts that turn, such as gears, wheels, and shafts. These moving parts, in turn, must be supported by non-moving sections. That particular portion of a machine which has been especially designed and constructed to support a turning or rotating part is called a bearing.

The simplest type of bearing for rotary motion is merely a hole drilled in a solid block of metal. A shaft can turn in this hole and also be supported by the block, as shown in Fig. 227. With

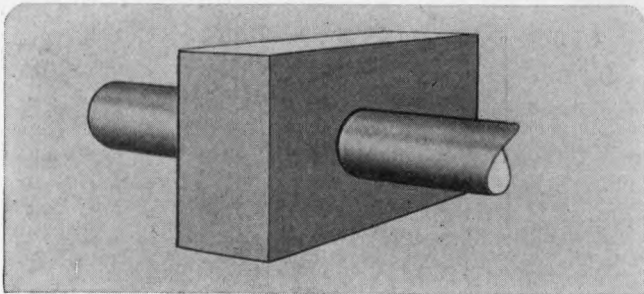


Fig. 227

this simple construction we may investigate some of the properties and duties of bearings in general. For instance, bearings are called upon to do two types of work. They may carry a radial load, which is pressure at right angles to the shaft and they may also take a thrust load or end thrust which is pressure coming from the side or end. The load a bearing carries is seldom entirely radial or thrust, as the two separate forces join in a combination load that continually fluctuates. To operate efficiently therefore, a bearing must carry radial loads, thrust loads, and the ever-varying combinations of the two.

When one surface slides over another one, as when a shaft revolves in its bearing, some of the force is transformed into friction. This, of course, reduces the amount of force that can be transformed into useful work. In an efficient machine, therefore, the frictional loss must be reduced as much as possible which is the purpose of bearings. Good bearings are especially necessary in the automobile because of the high speeds and

constantly shifting loads in all the moving parts of the car. When a car is travelling at a good rate of speed and in high gear, every moving part in the entire car is in extremely rapid motion and therefore the automobile needs many bearings.

There are three general types of bearings used in automobiles:

1. Plain bearings
2. Ball bearings
3. Roller bearings

As we have already seen, the most simple plain bearing is a metal block with a hole drilled through it, in which a shaft turns. However, since there are no arrangements for lubrication, this bearing is suitable only for light loads at very low speeds. Without lubrication, two metal parts that are in motion and also in contact with each other will heat up from the friction evolved. The heat will cause the metal parts to expand and stick fast to each other or seize. It is necessary, therefore, to use a metal for the bearing surface that will be able to hold a film of oil on its face at all times so as to furnish the proper lubrication for

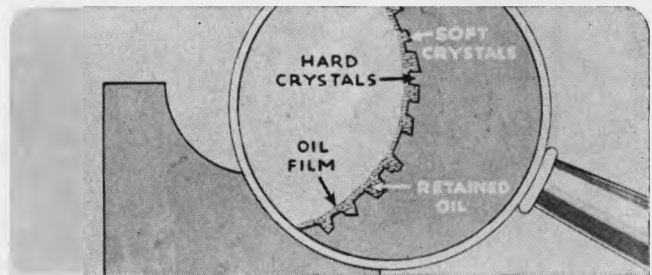


Fig. 228

the turning shaft. Moreover, since some wear is bound to occur no matter how efficient the lubrication, the various parts should be so constructed that most of the wear will occur in the bearing, as it can be replaced more cheaply than the shaft which may be very expensive. The bearing proper, therefore, must be of softer material than the shaft it supports and must offer as little frictional resistance as possible to the shaft's motion. To meet these needs, special bearing metals are used.

Analyses of Various Types of Babbitt Metal

83.0% Tin	6.0% Copper	11.0% Antimony	
90.0% Tin	3.0% Copper	7.0% Antimony	
50.0% Tin	2.0% Copper	15.0% Antimony	33.0% Lead
5.0% Tin		15.0% Antimony	80.0% Lead

One of the types of bearing metals commonly used for plain bearings in the motor car is babbitt metal, which is an alloy composed of varying amounts of tin, copper, antimony and lead. These various metals combine to form an alloy composed of both hard and soft crystals or grains, although not even the hardest of the bearing metal grains are as hard as the steel used for shafts.

The hard particles are called the bearing crystals which, protected by the oil film, support the load of the revolving shaft and resist the wear caused by its friction. The softer grains wear down more than the harder ones, forming tiny grooves or depressions in which the lubricating oil or grease is held, as shown in Fig. 228. This

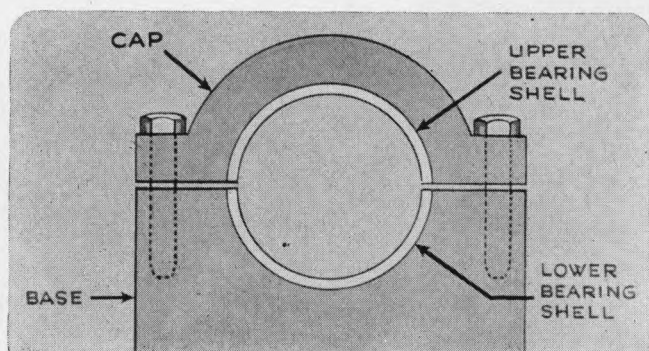


Fig. 229

lubricant forms a film over the entire surface of the bearing and prevents abnormal wear on the hard steel shaft and the soft bearing alloy.

Analyses of Various Types of Bronze Bearing Metal

16.0% Tin	82.0% Copper	2.0% Zinc	
14.0% Tin	83.0% Copper	3.0% Lead	
12.0% Tin	79.0% Copper	8.0% Lead	1.0% Phosphorus
8.0% Tin	78.0% Copper	14.0% Lead	

Bronze, an alloy composed mainly of tin and copper forming hard and soft particles, is also frequently used as bearing metal.

Because most special bearing metals are somewhat weak, they must be put into support. The body of the bearing is usually steel or cast iron and is in two parts, the cap and the base. These are held together with bolts. The actual bearing

metal, sometimes referred to as the shell, is also made in two parts to permit easy removal. The shell fits into the base and cap as shown in Fig. 229.

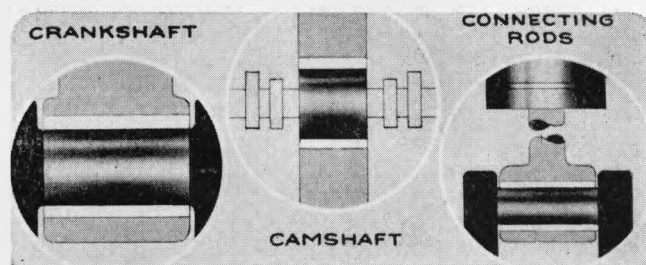


Fig. 230

That portion of the rotating shaft which actually turns on the bearing metal is called the journal. The shaft may be removed from the bearing merely by lifting off the cap and top shell. This type of bearing is known as a plain bearing. Plain bearings with the large amount of bearing surface that they make available, are suitable for carrying heavy thrust and radial loads. They are also used to advantage where the loss of energy due to friction is not particularly important. In the automobile, the use of plain bearings is largely confined to the engine where the heavy loads require large bearing surfaces. The most important engine bearings are the crankshaft bearings, camshaft bearings, and the connecting rod bearings, all of which are shown in Fig. 230.

The crankshaft or main bearings are usually made in two halves, the first half or base being stationary in the engine. The second half or cap is bolted down on the base. The crankshaft receives the full force of every power stroke of the pistons. Both the high speed of operation and the

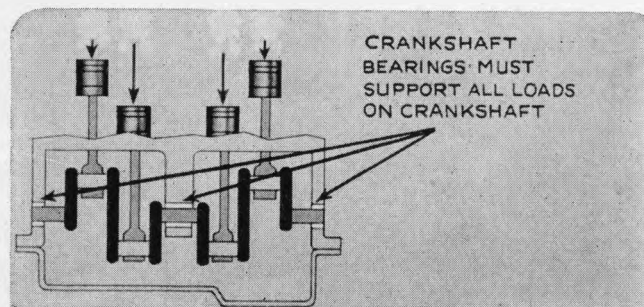


Fig. 231

continual shock of the power stroke produce a combination of thrust and radial loads. This must be borne by the main bearings, shown in Fig. 231, that support the crankshaft. Often, the direct thrust load is carried by some one bearing, the end of the bearing being turned up to form a sort of flange. The flange bears sideways against the shoulder on the crankshaft as shown in Fig. 232. The camshaft bearings are generally made in one piece and in the form of a ring. The camshaft

journals are made larger than the cam to permit removing the shaft endwise from the crankcase.

A camshaft must bear the force of lifting the valves against strong springs and frequently against the force of the exploding gases inside the cylinder. These radial loads shown in Fig. 233, as well as the friction caused by the shaft's revolution, must be absorbed by its bearings.

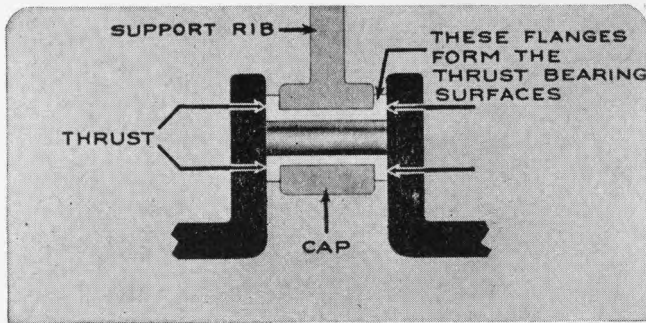


Fig. 232

The connecting rod bearings are the large split bearings on the lower end of the connecting rods and are the ones that bear on the crankshaft. The two halves of the bearings are held together with bolts and can be assembled and disassembled easily.

To lubricate the bearings, oil grooves and sometimes holes are machined into them. These grooves hold a supply of oil and permit the lubrication to find its way to the entire friction surface between the hard bearing crystals. Oil grooves may be seen in Fig. 234.

As we have seen, the large bearing areas of plain bearings are necessary in the engine. Elsewhere in the car however, plain bearings are used only where the relatively high loss of energy due to friction is not so important as in the brake pedals and gear shift levers.

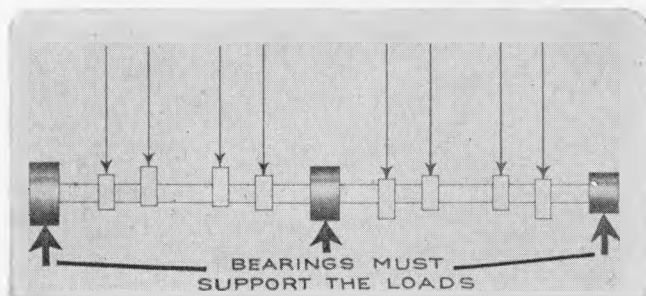


Fig. 233

Ball and roller bearings, frequently referred to as anti-friction bearings, are used throughout the power transmission system. In general, ball bearings are used where the load on the bearing is uniform and not too heavy, roller bearings where the load is heavy or the end thrust is great.

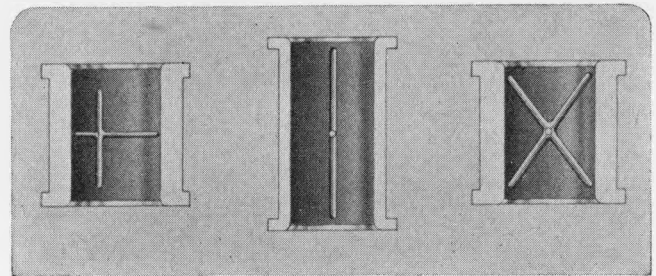


Fig. 234

Ball bearings are classified in three groups:

1. Annular ball bearings
2. Cup and cone ball bearings
3. Thrust ball bearings.

All ball bearings consist of at least three elements, two races and the balls. The races are steel rings, deeply grooved to hold the balls as shown in Fig. 235. The balls are usually further held in position and equally spaced by a cage, also called the retainer or separator, which is shown in Fig. 236. The inner ball race is fixed to the

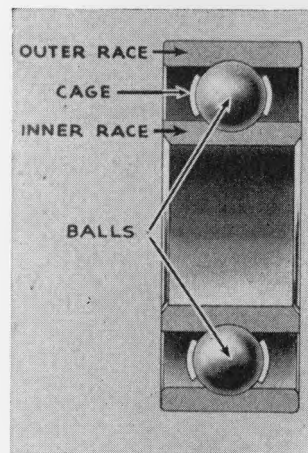


Fig. 235

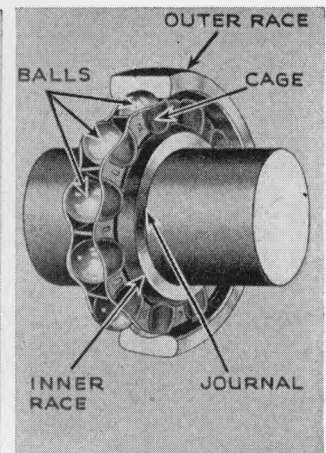


Fig. 236

journal of the shaft and the outer race is secured to a non-moving part of the machine. In Fig. 236 is illustrated the annular ball bearings with a single row of balls and is used mainly where radial loads only are encountered.

Another type of annular ball bearings has two rows of balls so arranged that they will adjust themselves when a considerable thrust load is added to the regular radial load—called, often, double-row ball bearings. Double-row annular ball bearings are used to some extent for supporting the drive pinion and also for taking the propeller shaft thrust in rear axle assembly.

The cup and cone ball bearing, illustrated in Fig. 237, has an outer race called the cup and an inner race called the cone. Its angular construction makes it adjustable to some degree and so it can take light thrust loads, as well as carry its regular radial load. The cup and cone type of ball bearing is used on the front wheels of many makes of cars. A one-direction thrust bearing

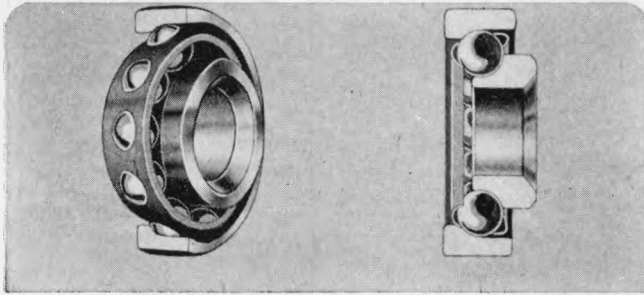


Fig. 237

consists of two grooved races with the ball cage between them. The two-direction thrust ball bearing is actually two bearings in one. In it, a one-piece ring with a groove on either side helps carry the ball. These bearings are illustrated in Fig. 238.

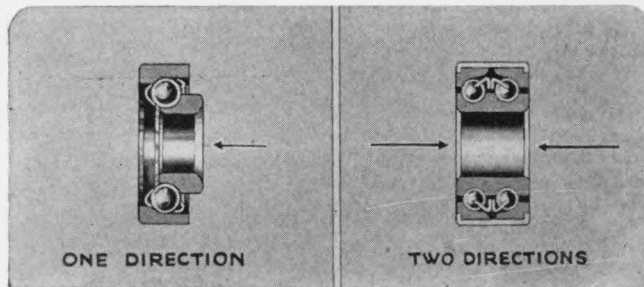


Fig. 238

Ball thrust bearings are used where heavy thrust load is to be resisted by a rotating member of the car. They are used in the clutch and on one or both sides of the differential and in other similar places. Whereas in a ball bearing the contact is only at a point for each ball, in a roller bearing each individual roller makes contact all along the line of its length. Roller bearings, therefore, can support somewhat heavier loads than ball bearings can.

There are two general classifications of roller bearings:

1. Straight roller bearings
2. Tapered roller bearings

Straight roller bearings are further classified as:

1. Solid roller bearings
2. Flexible roller bearings.

The straight solid roller bearing as illustrated in Fig. 239 consists of a number of small cylindrical steel rollers held in place by a separator between an inner and outer race. The shaft fits snugly into the inner race and turns with it. The use

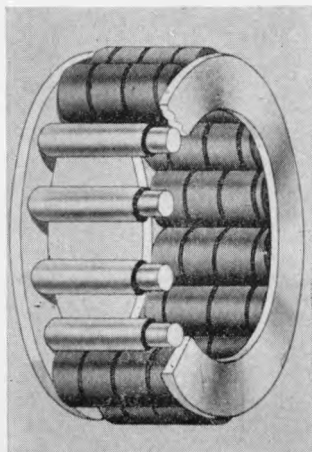


Fig. 239

of the straight solid roller bearing is confined to those places where it will be subjected to radial loads only. In the straight flexible roller bearing, the rollers are small flexible coils made of hard strip-steel. The rollers revolve on bars or journals which also hold the cage together. Outer and inner races complete the assembly. Due to the spiral winding of its individual rollers, this flexible roller bearing bends somewhat and so can stand considerable shock without breaking. It is used to some extent in rear axle assemblies for this reason.

When the rollers of a bearing are larger at one end than at the other, they are called tapered roller bearings. In the assembly shown in Fig. 240, the rollers are held in a cage between the inner and outer races. Tapered roller bearings will carry a radial load and also resist strong end thrust and so are widely used on propeller shafts, drive pinions, axle shafts, and for other similar purposes. Tapered roller bearings are especially serviceable for supporting the automobile wheels on their axles. These bearings are subjected to a radial load,—that is, they bear the car's weight when the automobile is running on a straight level load. Then, when the car turns the corner a thrust load is added to the wheel bearings in addition to the radial load that they are already carrying.

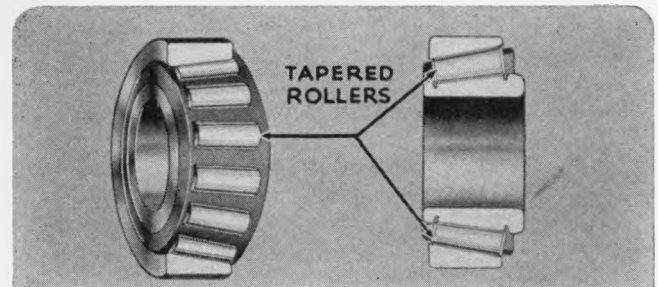


Fig. 240

Another type of roller widely used in bearings is the ball bearing—so called because of its shape. It is used quite similarly to other tapered bearings and is capable of supporting heavy loads.

There is a special type of roller bearing known as the needle bearing and, as the name suggests, this bearing is long and slim. It may be either straight or tapered. Needle bearings are often used in the universal joints and the front wheel pivot.

The lubrication of ball and roller bearings depends upon the load carried and the operating speed. In general, roller bearings require more lubrication than ball bearings, because the rollers offer a larger surface to be safeguarded. Neither requires the constant supply of oil that must be forced over the surfaces of plain bearings.

However, only high-grade long-lasting lubricants should be used in ball and roller bearings, lubricants that will not harden with use and so impede the free roller action of the balls and rollers.

Service Quiz

Q. Is it necessary to polarize generator after wiring has been disconnected from generator, regulator or battery?

?

A. Yes—Before engine is started, generator must be polarized by shorting between generator and battery terminals of regulator or by manual closing of cutout contacts.

!

Q. Can low insulation resistance (or slight leakage) be present in an automotive condenser without affecting ignition performance?

?

A. Yes—The automotive condenser only has to hold its charge for a very short period of time. It actually takes its charge and discharge in 1/12000 of a second. To help you conceive such speed, the condenser on an eight cylinder car will perform a complete operation eight times as often as any one of the intake or exhaust valves at an engine speed of 4500 r.p.m.

!

Q. Can direct acting (aeroplane type) shock absorbers be refilled on the car?

?

A. No—This type of shock absorber must be completely emptied and refilled with the exact quantity of fluid. (See Shop Manual for fluid capacities.)

!

Q. What are the most common causes of noise attributed to shock absorbers?

?

- A. a. Worn link bushings.
b. Absorbers empty or low on fluid.
c. Dirty fluid.
d. Stabilizer links and bushings worn or loose.
e. Loose absorber mountings.
f. Worn or loose spring shackles.
g. Loose tools in trunk.

Q. How much heat should be applied to an ignition coil to ensure an effective "hot" test?

?

A. Coil should be heated to normal operating temperature (equal to 60 minutes driving at moderate speed).

!

Q. At what intervals should speedometer heads be lubricated?

?

A. Every 10,000 miles of car operation.

!

Q. What is correct way of installing the lock nuts on engine connecting rod bolts of late model Chevrolet engines?

?

A. The stamped metal "pal" type of lock nuts should be installed with the cupped or open side of the nut toward the bottom end of the connecting rod bolts. The nut should be turned up against the large nut until finger tight and then one-half turn more. It is advisable to use new "pal" lock nuts when adjusting connecting rod bearings.

!

Q. Why does the oil distributor to rocker arm pipe on Chevrolet engines pass through the engine water jacket?

?

A. To stabilize the temperature of the engine oil going to the valve rockers and push rods.

!

Q. Can engine ignition timing be set further advanced when operating at high altitude than the usual standard settings for near sea level operation?

?

A. Yes—Advancing the ignition slightly from standard setting helps compensate for the lower engine compression pressures when operating at high altitudes.

!

Q. When should power cylinder of vacuum operated brakes be lubricated?

?

A. Standard practice is every 10,000 miles or six months. See manufacturers' manuals for full maintenance instructions of power cylinders, which should be cleaned out at least once a year to remove moisture if operating in the colder climates.

Unusual Accident Puzzles Service Man

Editor, PRODUCTS REVIEW,
General Motors Ltd.,
Oshawa, Ont.

Dear Sir:

In your December issue, you state if we have a problem you would try to solve it. This is not a problem but I'm very curious about it.

Recently a customer left his car outside in front of the garage and said "Run it in and take the chains off when you get time."

The car was a 1940 Oldsmobile 3600 series. I got into it backed it up and then ran it into the garage in low gear. I left the motor running while I took the chains off, then I got into the car again and shoved the gearshift lever into reverse and the car went ahead in low gear. I pulled the lever down into neutral, then the gearshift lever was very loose.

The selector shaft in the transmission broke off at the point A shown in the diagram.

I questioned the customer to see if the gearshift lever had ever been hard to put into gear at any time. He replied "he had never had any trouble shifting gears."

I don't know why it broke and was wondering if any trouble of that nature has occurred in the field, or if you would know the cause.

The shaft is twisted off cleanly like most axle shafts.

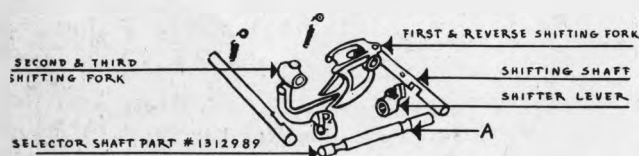
Sometime previous, the shaft must have been weakened to the breaking point and I thought maybe when the strain was put on it, would not the shaft be shifting the second and third shifter fork.

There was some trouble with second spud gears sticking on new models in 1940 but this car seems to have been all right. The mileage now is 57,360.

I would appreciate any information on this.

Yours very truly,

Markdale Garage Co.
per L. Piper.



REPLY TO MR. PIPER

Your enquiry of January 27th concerning the breakage of selector shaft, part No. 1312989, in a 1940 Oldsmobile, 3600 series, would indicate to us that this failure was purely accidental as far as you are concerned.

Your description of the type of break would clearly indicate that this shaft had been previously under considerable strain, causing it to be partly sheared. This may have resulted from the excessive strain required to enter either second or third gear when the oil in the transmission was extremely heavy due to low temperature, probably in the fall, before the oil had been changed to winter grade. You happened to be the unlucky one to finalize the breakage, perhaps by giving the gearshift a little extra shock when putting the car into low gear to move it into your garage or attempting to put it in reverse to move it out again.

The twisting and breaking of this shaft is very unusual and was undoubtedly caused by heavy strain in shifting gears.

Thanks very much for the sketch of the affected parts. This helped very much in studying the trouble you reported. May we also congratulate you on the quality of this sketch.



Smart Custom Designs by Canadian Airman

On the familiar stationery of the Royal Canadian Air Force, the following letter recently reached the head office of General Motors in Canada. As it is self-explanatory, we will reproduce it as it was written:

Editor, PRODUCTS REVIEW,
General Motors,
Canada.

Dear Sir:

I saw PRODUCTS REVIEW in our lounge and studied its contents being interested automotively.

I enclose a photostat of a page from a Motor Journal (Nov. 1938) which I submitted the material shown.

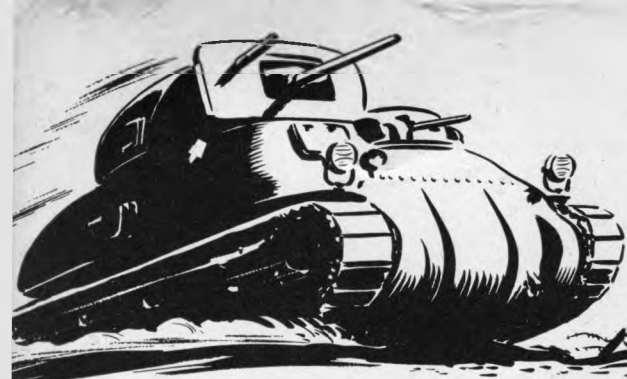
Since then I have executed more custom designs, including styles suggested for Mr. Paul Van Zeeland (former Premier of Belgium) and a Rolls for Countess Van Den Baker (Boston) and others.

If this type of material you think might be of interest to the readers of PRODUCTS REVIEW, I should be pleased to send you the photos to print from.

A reply at your convenience will be appreciated.

I remain,

Yours truly,
(SGD) George A. Moffitt
(R179055)
R.C.A.F.
East Camp, Debert, N.S.



TANKS



Six Months Ago This Was Rolling Farmland. Now a gigantic new plant has been built and powerful M-4 tanks are being turned out by Fisher Body on the vast assembly lines pictured above. The plant was started in January, and by July quantities of the newest type American tank, the all-welded M-4's, were being shipped in train-load quantities.



With Their Hard-Hitting 75MM Cannon pointing upwards in a formidable line, these all-welded M-4 tanks built by Fisher Body are lined up waiting inspection after having been given a stiff test-run. Tanks such as these are rolling off the line in a new Fisher plant which reached volume production just six months after ground was broken.

First All-Welded 30-Ton Tanks Built by Fisher Body in U.S.

The Fisher Body Division has already completed a large number of the latest type Land Dreadnoughts—the all-welded M-4, in the new tank plant built by the Division for this special purpose.

Six months after ground was broken for the new plant the first big tank was shipped to the fighting forces.

Lines of freight cars loaded with tanks wrapped in protective covering, like shrouded giants, now leave the plant almost daily.

When the United States entered the war the welded M-4 was only in a blueprint stage. In January, 1942, Fisher Body received the contract to build the new type battle wagon. The first tank was not scheduled to be built until the new plant was completed, but engineers went to work in another plant immediately. Fixtures and tools for the new models were designed and built, the tank itself was designed for welded construction and the first of the new M-4's was turned out in 47 days.

A large test area, including a one-mile concrete track, has been built adjacent to the new plant. As each tank comes off the line it is given a gruelling test run, inspected and then loaded on cars for immediate shipment.

Thus since Pearl Harbour a new and vastly improved design of tank has been developed, a mammoth plant has been rushed to completion and powerful new machines to attack the Axis are pouring from it each day.

Already, it is learned, the M-4's have had their baptism of fire and have stood up well under the test.

TOO, CARRY THE GENERAL MOTORS TRADE MARK!

First All-Welded

Tank Hulls Built

By GM In Canada

General Motors of Canada is also in full swing production on an all-welded tank job, as shown in the pictures on page 7. However, only the lower tank hulls are made here and they are designed for a slightly different type of battle wagon than that of the Fisher Body Division.

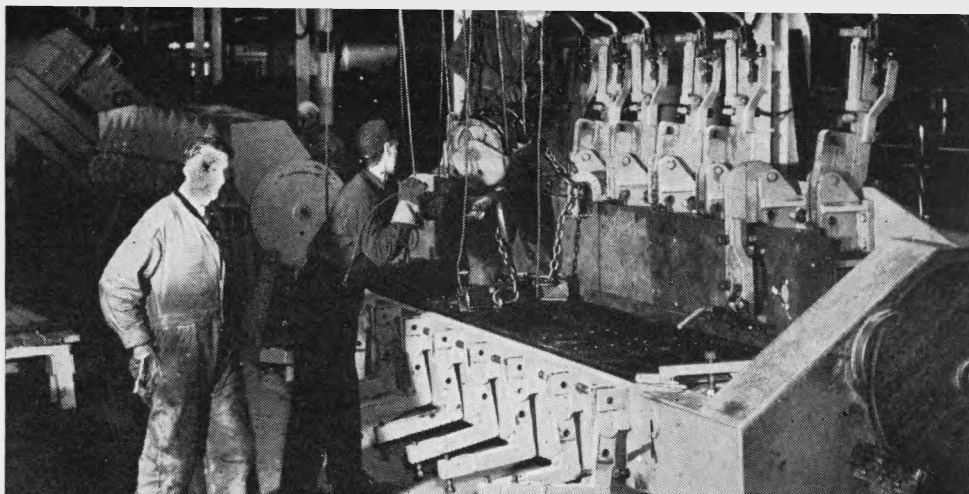
In a remarkably short time the mass production of tank hulls has been accomplished and they are now being shipped regularly to another plant in Canada where the complete tank is assembled.

Domestic car production lines formerly occupied the space now used for building and assembling the new tank hulls.

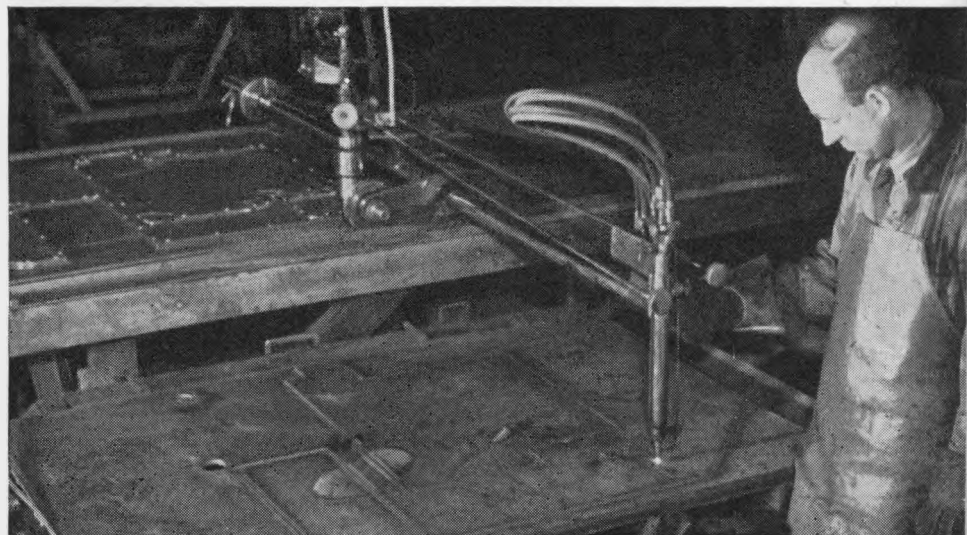
The same kind of adaptation to the handling and producing of a much heavier type of construction than in peacetime has been necessary in Canada, just as it was necessary at Fisher Body. Men who were not familiar with this type of work have been quickly organized into a smoothly running production unit.

New fixtures and tools for the heavy tank hulls had to be designed and built but once again mass production "know how" did the trick.

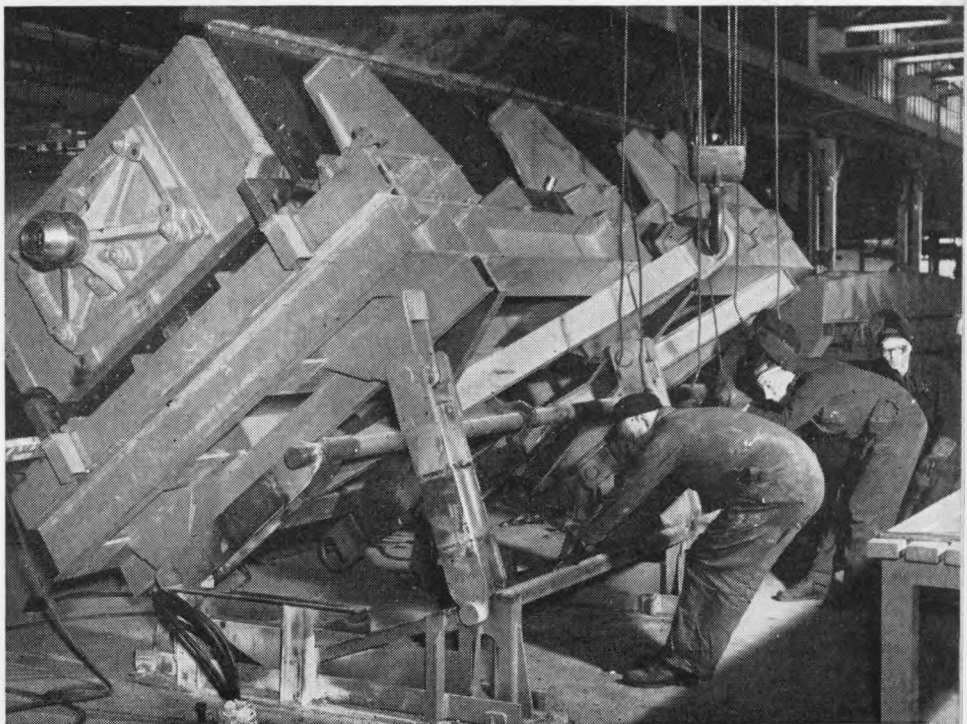
As evidence of the type of adaptation of which this plant is capable—a single turn-over fixture was devised which turns the whole assembly over for welding bottom plates after the side and sponsons have been put together. This fixture is a sample of how ingenuity enables production to continue with no interruptions from the flame cutting of the original sheet metal to the final assembly of the tank hull.



Arthur (Lucky) Cole, Edwin Cochrane and Russ Lindsay are here seen putting the side plates and sponson into the sub-assembly fixture to be welded together. For the information of non-technical people, the "sponson" is the top horizontal cross piece shown in the foreground in the picture below.



Each Bulkhead Has To Be Cut To a Specific Pattern. This is done by means of flame cutting with a magnetic tracer. Roy Wellman is here seen operating the machine which traces the outline without guidance until the job is completed.



An External Fixture Holds All the Sub-Assemblies of the hull together prior to final assembly. Shown in this picture are, left to right: Andrew Muha, Melvin Wotten and Clarence Fenton. In this fixture the sides sponsons and bulkheads are welded into one unit.

Servicing the Handy Vari-Speed Governor

1940 16H, 96H; 1941-42 1700 and 9700; Imported G.M.C. Trucks using Handy Vari-Speed Governors

(Continued from last issue)

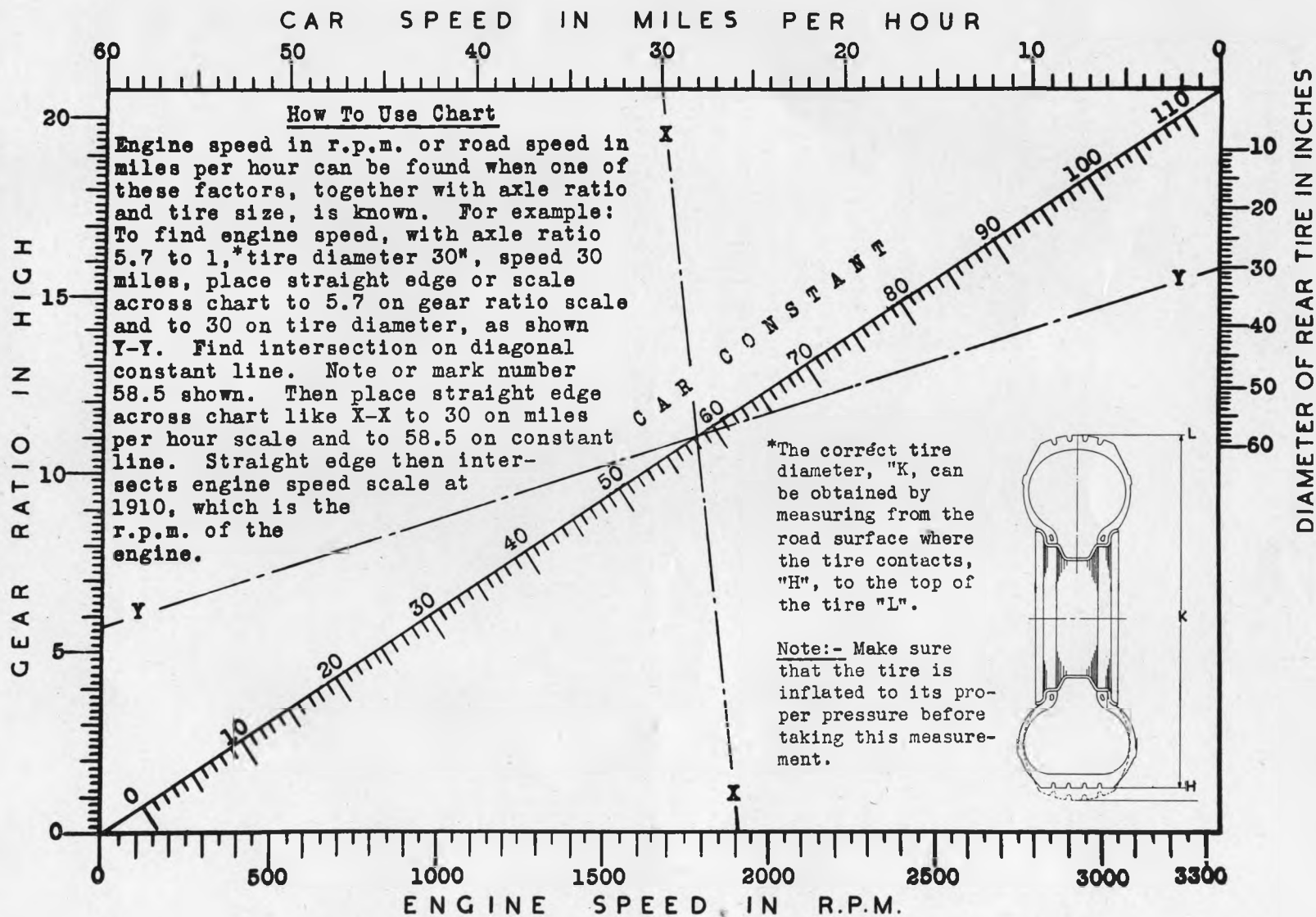


Fig. 30.

PRODUCTS REVIEW

Item No.	Part No.	Quan.	Part Name
X1		1	Valve Shaft Assembly
X2		1	Valve Assembly (Specify No. of Holes and with or without Lugs)
X3	25578	2	Valve Screw
X4	25600	2	Valve Screw Lock Washer
X5		1	Spring Assembly
X6	22027	2	Cam Ribbon or Piston Rod Clip
X7*	22111 (9)	1	Speed Adj. Screw Assy.
X7*	22419 (10)	1	Speed Adj. Screw Assy.
X7*	22457 (11)	1	Speed Adj. Screw Assy.
X8	22033	1	Initial Tension Screw (Old Style)
X9	22311	1	Adjusting Screw Cap Assembly
X10	H8815	1	Expansion Plug (Piston)
X11	24897	1	Stabilizer Piston
X12*	25159	1	Piston Rod and Spring Assembly (Old Style), $\frac{5}{8}$ " Diameter, for V5, V5S, V54S
X12*	25160	1	Piston Rod and Spring Assembly (Old Style), $\frac{5}{8}$ " Diameter, for V6, V6S, V65, V65S
X12**	25161	1	Piston Rod and Spring Assembly, $\frac{1}{4}$ " Diameter for V5, V5S, V54S
X12**	25162	1	Piston Rod and Spring Assembly, $\frac{1}{4}$ " Diameter, for V6, V6S, V65, V65S
X13		1	Check Valve (Obsolete—Eliminate)
X15	H8719	1	Expansion Plug (Spark Plunger)
X15	23900	1	Brass Plug
X16	25512	1	Plug (Valve Shaft)
X17	24891	2	Roller Bearing Assembly
X18	22108	1	Air Filter Felt
X19	22107	2	Air Filter Cover
X20	23887	1	Vacuum Plunger
X21	24915	1	Plunger Spring
X22	22031	1	Cover Gasket (Vari-Speed)
X22	24564	1	Cover Gasket (Visible Action)
X23	22032	1	Cover
X25	21035	2	Cup Seal and Wire Assembly
X26	H6321	1	Cover Screw
X27	22110	1	Throttle Shaft Clip
X28	20828	2	Seal Wire Cup (See X25)
X29	20833	2	Seal Wire Only (See X25)
X32	21124	1	Cover Drive Screw (Std. V.S.)
X32	24566	1	Cover Drive Screw (Oversize-VA)
X33		1	Valve Assembly

Item No.	Part No.	Quan.	Part Name
X34	24133	1	Adjusting Screw Cap Only
X35†	23911-9	1	Adjusting Screw
X35†	23911-10	1	Adjusting Screw
X35†	23911-11	1	Adjusting Screw
X36†	23908-9	1	Adjusting Screw Bushing
X36†	23908-10	1	Adjusting Screw Bushing
X36†	23908-11	1	Adjusting Screw Bushing
X37		1	Cam Spring (Sold as X5 Only)
X38		1	Cam Ribbon Rivet (Sold as X5 Only)
X39		1	Spring Anchor (Sold as X5 Only)
X40		1	Cam Ribbon (Sold as X5 Only)
X41		1	Cam Weight (Sold as X1 Only)
X42		1	Governor Body (Not Sold Separately. Replace Complete Governor Assy.)
X43	22337	1	Cam Weight Rivet
X44		1	Cam (Sold as X1 Only)
X45		1	Valve Shaft (Sold as X1 Only)
X47		1	Adj. Screw Washer (Sold as X7 Only)
X48		1	Adj. Screw (Sold as X7 Only)
X49		1	Adj. Screw Nut (Sold as X7 Only)
X50*	23342	1	Initial Tension Screw Sleeve
X51	23740	1	Piston Plug
X52		1	Piston Spring (Sold as X12 Only)
X53		1	Piston Rod (Sold as X12 Only)
X54		1	Valve Arm (Sold as X2 Only)
X55		1	Valve (Sold as X2 Only)
X56	25088	1	Piston Rod (For V6, V6S, V65, V65S Only)
X56	24914	1	Piston Rod (For V5, V5S, V54S Only)
X57		1	Valve Arm Pin (Sold as X33 Only)
X58		1	Valve Arm (Sold as X33 Only)
X59		1	Valve (Sold as X33 Only)
X60		1	Adjusting Cap Rod (Sold as X9 Only)
X61		1	Adjusting Cap (Sold as X9 Only)
X72	21705	1	Plunger Spring (Old Style)
X73	21702	1	Vacuum Plunger (Old Style)
X112	24918	1	Stabilizer Piston
X113	24924-9, 10 or 11	1	Adjusting Screw (Sold as X114 Only)
X114	25072-9, 10 or 11	1	Adjusting Screw Assy. (Check Old Part for Marking 9, 10 or 11)
X115	25778	1	Body Plug (Grooved)

†—These parts are not available. Order as No. 25072-9, 10 or 11 and use with new Cap Assembly No. 22311.

*—These parts not available. Replace complete governor.

**—Check for correct piston rod diameter.

NOTE: Part Numbers are shown for parts which are common to all governors. The Part Numbers of some items which apply to certain model governors only will be found listed in the specifications shown on Page 93. Where the Part Number is not shown in either place, it can be ordered by the item number shown in the above list, giving the part name. Make sure that the model of the governor is also included.

Part No.	Description	Dealer Net Price
42100	Bendix Cleaner—5 Gal.	\$13.75 + 12% surcharge
45616	Bendix Cleaner—3 Gal.	\$8.25 + 12% surcharge
Price for Bendix Cleaner is slightly higher in Western Canada.		
23524	$\frac{1}{8}$ " Handy Allen Wrench	\$0.30 + 15% surcharge
A24283	Handy Hollow Wrench	\$2.80 + 15% surcharge
(Prices subject to change without notice.)		

Handy Governor Service Stations

Where a Dealer cannot satisfactorily repair a Handy Governor, service on these units, also replacement parts, tools and cleaner fluid can be obtained through the following Stations:

ALBERTA—

Calgary—Huttons, 131 11th Avenue West.
Edmonton—Loveseth Service Station, Ltd., 10601 Jasper Ave.
Lethbridge—Hutton's, 321 8th Street.

BRITISH COLUMBIA—

Vancouver—Boulton Limited, 999 Seymour Street.
Victoria—Boulton (Victoria) Ltd., 1100 Yates Street.

MANITOBA—

Winnipeg—Beattie Auto Electric Limited, 176 Fort Street.

SASKATCHEWAN—

Moose Jaw—Great West Battery & Electric Ltd., 48 High St.
Saskatoon—Lone Star Auto Electric Service, 2nd Avenue & 24th Street.

NEW BRUNSWICK—

Moncton—Buzzell, R. K., 21 Bonaccord Street.
St. John—Battery & Electric Service Ltd., 90 Duke Street.

NOVA SCOTIA—

Halifax—Battery & Electric Service Ltd., 38 Grafton St.
Sydney—Cape Breton Battery & Vulcanizing Co., 416 George Street.

ONTARIO—

Barrie—W. L. Brennan, Bayfield Street.
 Belleville—Quinte Battery Service Station, 4-6 Dundas Street.
 Brantford—Dell's Electrical Service, 42 Dalhousie Street.
 Brockville—Welch & Johnston Limited, 40 King Street.
 Chatham—Labombard Auto Electric, 7 Dover Street.
 Guelph—City Battery & Electrical Service, 169 Woolwich Street.
 Hamilton—Dell's Electrical Service, 43 Main Street East.
 Hamilton—Toronto & Hamilton Electric Co. Ltd., 99-103 MacNab Street North.
 Kingston—Frontenac Auto Electric Service, 19 Brock Street.
 London—Universal Ignition & Battery Co., 294 York St.
 North Bay—North Bay Auto Electric, Fraser & First Streets.
 Oshawa—W. R. Chapman, 16 Church Street.
 Ottawa—Welch & Johnston Ltd., 474 Bank Street.
 Owen Sound—Frank Slater, 801 2nd Avenue East.
 Peterborough—Cliffe Towle, 392 Water Street.
 St. Catharines—Sadier's Auto Electric, 69 Ontario Street.
 Sault Ste. Marie—Collins Bros., 180 Gore St.
 Sudbury—Duncan Bros., 84 Cedar Street.
 Toronto—Auto Electric Service Co. Ltd., 1009 Bay Street.

Windsor—Howitt Battery & Electric Service Co. Ltd., 347 Sandwich Street.

Woodstock—Woodstock Auto Electric, 484 Peel Street.

PRINCE EDWARD ISLAND—

Charlottetown—Batt & MacRae, 171 Grafton Street.

QUEBEC—

Montreal—Auto Electric Limited, 3429 Park Avenue.

Montreal—Battery & Electric Service Co., 1124 Bleury St.

Montreal—International Electric Co., Ltd., 1037 Bleury St.

Quebec—Marcel Rochette Ltee., 80 Rue St. Francois.

Sherbrooke—Sherbrooke Auto Electric Inc., 51 Wellington Street South.

Auto Electric Service Company Limited in Toronto have a special calibrating machine for checking Handy Governors, as shown in Fig. 31, which operates as follows:—

The weight "L" is hung in a specified notch on the arm which contacts the governor throttle plate, the governor adjusting screw being set to give the number of active coils shown in the specification chart on Page 93. The governor adjusting screw bushing is then adjusted to give a specified reading on the dial gauge. When the governor is installed on an engine for which it was designed the maximum R.P.M. which can be obtained is shown in the column "Speed Setting" of the specification chart.

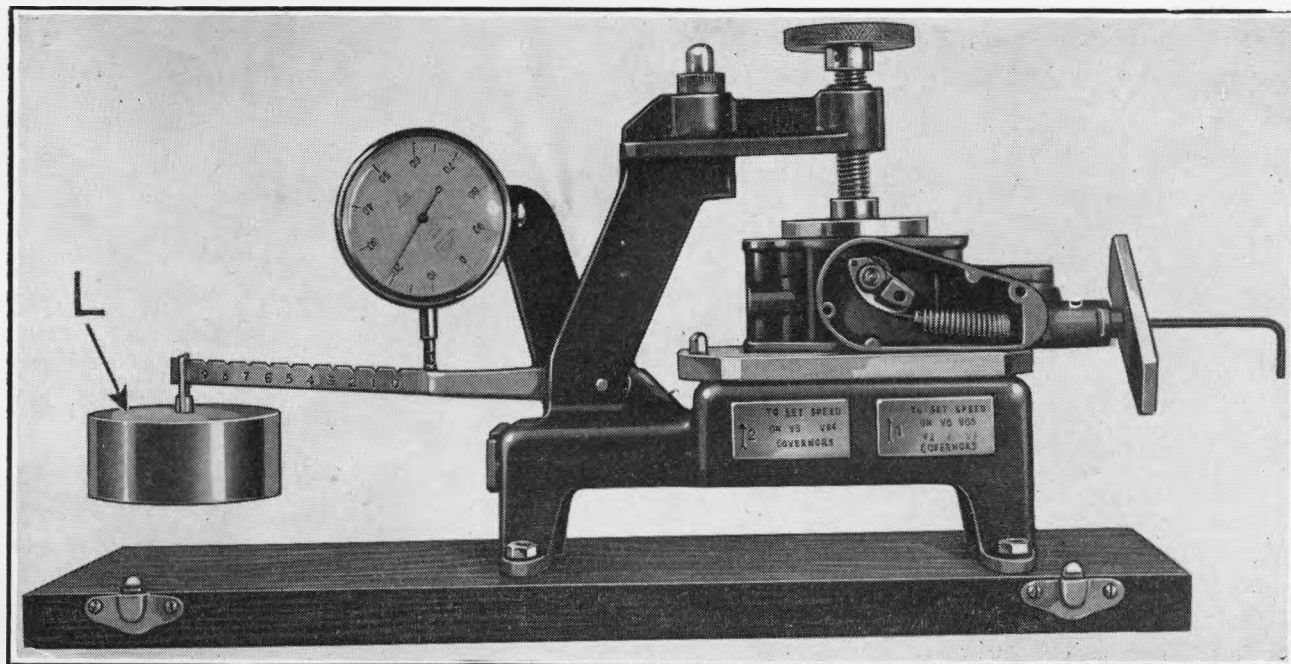


Fig. 31.



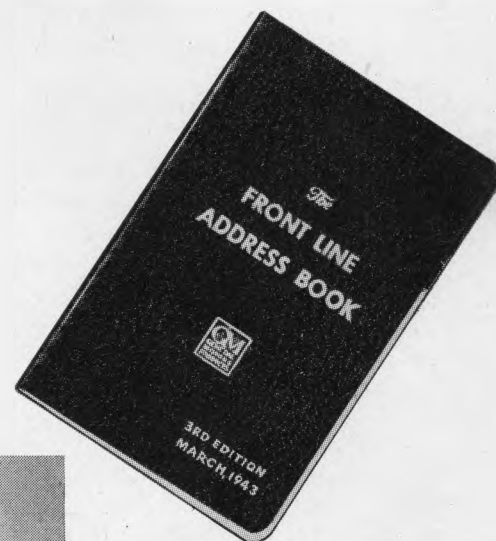
GM KEEPS IN TOUCH with the Men in the **Armed Forces**

**FORMER EMPLOYEES ADVISED OF
DOINGS AT HOME AND ABROAD**

Four times a year, General Motors employees now in the armed forces receive a brightly coloured little pocket-size magazine titled "The Front Line." Perhaps twice a year the mail brings them a smaller book called "The Front Line Address Book." There are now some 2800 GM people with Canada's army, navy and air force stationed throughout the world. They look forward with interest to the arrival of these messengers from the Land of the Maple Leaf. They are encouraged by the editor of the "Front Line" to write their experiences and they do.

The Address Book carries the latest active service address of every Company and dealer employee in uniform. It keeps men informed of the whereabouts of peace-time comrades; helps bring them together if they are in the same zone.

Each Christmas, since the beginning of the war, General Motors sends to employees a well-filled Christmas box which, to judge by enthusiastic acknowledgments, is a welcome gift.

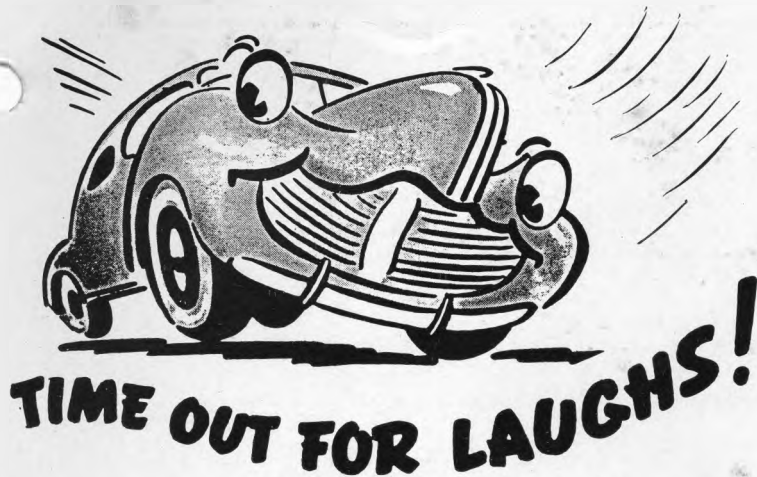


Centre: The Address Book.



Top Left: The colourful, newsy "Front Line" magazine published in handy "Digest" size.

Bottom: Presentation ceremony at General Motors plant, Oshawa. Ed. Butler receives the service flag, on behalf of employees from W. A. Wecker, General Manager.



"What are you crying for, my little man?"
 "Wa-w-w! Mummy's gone and drowned all the kittens!"
 "Well, well! That's too bad!"
 "Yeah! She told me I could do it!"

★ ★

"Isn't your boy rather young to be joining the army?"
 "No-o-o! You see he's going into the infantry."

★ ★

"What's all the excitement? There's an ambulance in front of Brown's house."
 "They're taking him to the hospital for beating up Mrs. Brown."

★ ★

Scene—a railroad ticket office.
 "I want a round trip ticket."
 "Yes, mam, but where to?"
 "Why back here, naturally!"

★ ★

Two girls were walking past the stage door of a theatre at which a troupe of midgets were playing. Several of the little fellows were lounging nearby when one girl sighted them and let out a scream!
 "What's wrong?" queried her pal. "They're just midgets!"
 "Gosh," replied the first girl, "I was afraid for a minute they were rationing men!"



A Friend, Indeed!



Your AC Spark Plug Cleaning Machine is more important to you now than it ever was in peace time. And here's why:

- 1 Your cleaner puts new performance into plugs and as a result, saves gas. It also conserves plugs for your customers.
- 2 Your cleaner brings in customers for plug cleaning. They CAN be made buyers of other necessary service.
- 3 Your cleaner exposes the need for plug replacement when replacement becomes necessary.

SO — approach your customers with the question, "Had your plugs cleaned lately?" It's for their benefit — and yours.



Other Well-Known United Motors Service Products

Delco-Remy Electrical Equipment; Shock Absorbers; Delco Motors; Guide Lamps; Packard Cable Products; Ball and Roller Bearings; AC Oil Filters, Speedometers, Air Cleaners and Fuel Pumps.

T143-AC

UNITED MOTORS SERVICE DIVISION OF
GENERAL MOTORS PRODUCTS OF CANADA, LIMITED

"Production, Production -and More Production!"

GENERAL MOTORS REPORTS ON A FULL YEAR OF WAR ACTIVITIES IN THE UNITED STATES AND CANADA

FIRST, AN APPRECIATION . . .

While the figures and statistics shown below are impressive, they do not tell the full story. They do not show, for example, the cooperation we have had from government officials as well as those in the armed services at every step of our progress toward the record production already achieved. Nor do they indicate the fine spirit of cooperation shown by our suppliers and subcontractors, on whom we rely for so much of the work.

They cannot convey an adequate picture of the eagerness of hundreds of thousands of General Motors' men and women in the United States and Canada to back the courage and determination of our fighting men with an ample supply of the

most effective fighting weapons in the world. They cannot give even a hint of the initiative displayed by our engineers and mass-production technicians in effecting manufacturing economies and efficiencies which have resulted in the saving of critical war materials and manpower, and which have already made possible price reductions amounting to hundreds of millions of dollars.

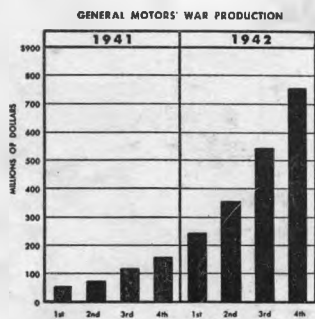
These are the practical results that come from encouraging individual effort and initiative—the democratic way of getting the job done. Machines alone cannot win the victory—it will be won by free men working and fighting together for the only kind of future worthy of the United Nations.

The tremendous war job ahead at the threshold of 1942 called for the "know-how" of all our engineers, designers, mechanics and managers, skilled and experienced in mass production. It required the retooling and rearranging of many of our plants for maximum production of war products. It meant designing and building new machines, and tools to make them—training skilled hands to perform

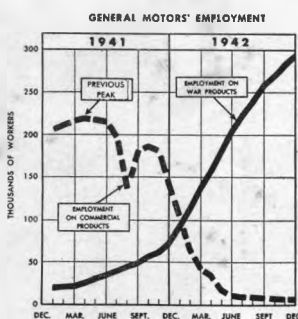
new tasks, and teaching the unskilled—building employment and payrolls to unprecedented peaks—organizing and enlisting the support of our network of thousands of suppliers and subcontractors. It also meant establishing and operating training schools to teach thousands of men in the armed forces how to properly service and maintain General Motors-built war equipment

Now at the beginning of 1943 these basic tasks have all been accomplished, and during their accomplishment General Motors' plants made and delivered a mighty, rising tide of war materials. That tide continues to rise with mass-production technique swinging into full stride.

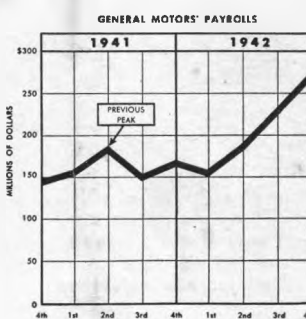
Thus General Motors answers our governments' call for "Production, production—and more production!"



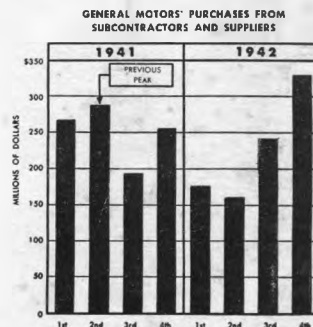
We regret that for military reasons we cannot report the number of guns, tanks, planes, shells, armored cars, trucks, Diesel engines for submarines and other uses, airplane instruments and hundreds of other items made and delivered by General Motors. We can say, that in dollar value they totaled approximately \$1,900,000,000—almost two billion dollars—in the year 1942 alone.



In June 1941, factory employment was 250,000—an all-time high. Since then, 50,000 replacements have been made, largely to replace men who have gone into the armed services, and 49,000 additional employees have been hired. To 54,000 salaried workers employed in June 1941, 17,000 have been added. At the end of 1942, General Motors' employment reached 370,000—66,000 above the previous peak. It is anticipated that 100,000 will be added



General Motors' payrolls, like General Motors' employment figures, are at an all-time high in our 105 plants in 46 communities and 13 states—and five plants in Canada. The December 1942 payroll was \$88,000,000. This was 45% more than the peacetime peak in June 1941. The total General Motors' payroll for 1942 was \$839,000,000—28% more than in 1941—the highest previous year.



The fastest, most effective way to distribute war work among the greatest number of producers is primarily through larger industrial organizations who have technical staffs available and who are accustomed to working with suppliers and subcontractors. Purchases from subcontractors and suppliers in the fourth quarter of 1942 were \$330,000,000, compared with the peacetime peak of \$288,000,000 in the second quarter of 1941.

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